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(54) **COMPACT INTEGRATED COMBUSTION REACTORS, SYSTEMS AND METHODS OF CONDUCTING INTEGRATED COMBUSTION REACTIONS**

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(52) **U.S. Cl.**
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(58) **Field of Classification Search**
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See application file for complete search history.

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(57) **ABSTRACT**

A compact integrated combustion reactor is described. In a preferred embodiment, the combustion catalyst is disposed in a staggered configuration such that the hot spot in an adjacent endothermic reaction chamber is substantially less than would occur with a conventional, unstaggered configuration. The integrated reactor may also include a methanation chamber for methanation of a reformate product. Systems containing reactant and product streams, and methods of conducting integrated combustion reactions are also described. A staggered catalyst conformation can be used more broadly for thermal chemical reactions requiring heat transfer in a layered device.

28 Claims, 5 Drawing Sheets